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NEW CALIFORNIAN UREDINAE

By P. DIETEL

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WILLIS LINN JEPSON

AND OTHERS, OF THE DEPARTMENT OF BOTANY, UNIVERSITY OF CALIFORNIA.

VOLUME I.

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COLINA.

C. Caffrorum (=*Polypodium Caffrorum*, L.,=*Mohria thurifragra*, Swartz). The name commemorates the French Professor Colin.

Delphinium Blochmanæ. *D. ornatum*, Greene, Flora Franciscana, 304. There is an older and European *D. ornatum*, and our plant may well take the name of the lady who last spring rediscovered it, confirming its specific rank.

Tradescantia pinetorum. *T. tuberosa*, Greene. Bot. Gaz. vi. 185, not Roxb. Corom. ii. 5, t. 108.

Eunanus Congdoni. *Mimulus Congdoni*, Rob. Proc. Am. Acad. xxvi. 175.

NEW CALIFORNIAN UREDINEÆ.

By P. Dietel.

By the kindness of Mr. Holway I have received numerous Uredineæ from California, which in part are new or have not been sufficiently distinguished hitherto from similar species. The specimens have been collected by Mr. W. C. Blasdale, Berkeley, Prof. A. J. McClatchie, Pasadena, and Mr. E. W. D. Holway, Decorah (Iowa). Some of these new species have already been described in Hedwigia (1893, pp. 29, 30), and in the Botanical Gazette (1893, No. 7). In the following we give descriptions of a further series of them.

Uredo coleosporioides, D. & H. Sori on the stems and under surfaces of the leaves, orange-red. Spores ovoid to oblong, echinulate, with colorless membranes, 22—30 x 15—25 μ.

On *Castilleia foliolosa*. Berkeley, Cal., June, 1893, leg. Blasdale. In its general appearance this species resembles the uredoform of a *Coleosporium*, but the spores are not formed, as is the case in this genus, in chains.

Uredo Castilleiæ, D. & H. Sori dark brown, almost con-

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cealed by the pubescence of the host plant, principally hypophyllous. Spores broadly oval or spherical, chestnut brown, finely echinulate, 24—30 μ in diam.

On *Castilleia foliolosa.* Berkeley, Cal., June, 1893, leg. Blasdale.

Uredo sphacelicola, D. & H. Spots yellowish or absent. Sori amphigenous on the leaves, roundish, ca. 1 mm. in diameter, pulverulent, at first covered by the ruptured epidermis, pulvous. Spores globose or nearly so, brown, densely echinulate, measuring 32—40 μ in diam.

On *Sphacele calycina.* Mt. Tamalpais, Cal., May, 1893, leg. Blasdale.

Uromyces Chlorogali, D. & H. Amphigenous. Æcidia isolated, minute, opening by an oblong fissure of the pseudoperidium; peridial cells loosely coherent; æcidiospores globose or broadly ovate, finely verrucose, with a colorless membrane, 31—40 μ in diam.—Teleutospore layers irregularly scattered, first covered by the epidermis; soon naked, roundish or irregular, dark brown. Teleutospores globose, ovate or irregular, thin walled, not thickened at the apex, smooth, brown, 30—40 x 25—35 μ. Pedicels ca. 30 μ, deciduous.

On *Chlorogalum pomeridianum.* Berkeley, Cal., May, 1893, leg. Blasdale.

Puccinia Blasdalei, D. & H. Æcidia loosely arranged into roundish groups. Peridia opening with longitudinal fissures. Æcidiospores orange-yellow, finely verrucose, ovoid or polygonal, 24—31 x 18—14.—Uredospore pustules oblong, sometimes confluent, surrounded by the epidermis; uredospores broadly ovate or subglobose, membranes echinulate, nearly colorless, with orange-red protoplasmatic contents, 27—32 x 22—30 μ.—Teleutospores: sori black, confluent, covered by the epidermis; spores oblong or clavate, very irregular, mostly truncate or pointed above, rounded or attenuated below, slightly constricted at the septum, brown, apical thickening moderate; 36—60 x 18—27 μ. Pedicels

about half the length of the spores. Amongst the bicellular spores occur unicellular ones (mesospores). The teleutospores are enveloped by dark chestnut-brown paraphyses.

On the leaves and stalks of *Allium serratum*. Near Antioch, Cal., May, 1893, leg. Blasdale.—The uredosporic stage seems to develop only to a small extent.

Puccinia procera, D. & H. Uredosori amphigenous; principally epiphyllous, oblong or linear, enveloped by the ruptured epidermis, ochraceous. Uredospores ovoid to spherical, finely echinulate, brownish, 32—45x30—38 μ. Teleutosori hypophyllous, linear, disposed into parallel lines, covered by the unbroken epidermis, blackish, surrounded by a dense row of brown paraphyses. Teleutospores very different in form and size, oblong to linear, slightly constricted at septum, usually narrowed below, lower cell often stalk-like elongated, vertex mostly truncate and little thickened, smooth, clear brown, 45—100 x 18—23 μ. Pedicels short, brownish.

On *Elymus condensatus*. Pasadena, Cal., Aug., 1893, leg. McClatchie.—From *Puccinia Rubigo-vera* (DC.), Wint., which is said to occur on *Elymus condensatus; P. procera* differs by the dimensions of the teleutospores as well as of the uredospores.

Puccinia Cryptanthes, D. & H. Sori scattered on the stems and the lower side of the leaves, oblong, minute, (0, 1—3 mm.), sometimes confluent. Uredospores broadly oval or globose, 24—28 x 20—24 μ, rich brown echinulate. Teleutospore layers black, pulvinate. Spores irregular, mostly oblong, commonly rounded at the base, upper cell pointed or truncate, often obliquely, sometimes rounded, central constriction little, apical thickening 5—10 μ, smooth, brown, 34—50 x 19—30 μ. Pedicels not firm, surpassing somewhat the length of the spores. Single-celled teleutospores rather numerous.

On *Cryptanthe Torreyana*. Camp Badger, Cal., July, 1892, leg. Holway.

Puccinia Eulobi, D. & H. Uredospores: sori scattered,

erumpent, oval, 1—2 mm., brown. Spores ovoid or spherical, 24—32 x 18—24 μ, brownish, very minutely echinulate.—Teleutospores: sori long, covered by the lead colored epidermis, afterwards naked, pulvinate, black. Spores oval or fusiform, base rounded, apex conical or rounded, sometimes pointed, somewhat constricted in the middle, 43—66 x 18—24 μ. Epispore smooth, yellowish-brown to chestnut brown, 6—13 μ thick at the apex. Pedicels firm, brownish, about twice the length of the spores.

On all green parts of *Eulobus Californicus*. Pasadena, Cal., leg. McClatchie (No. 295).

Puccinia conferta, D. & H. Hypophyllous producing yellow patches on the leaves of the nourishing plant. Sori minute. 0.3—0.5 mm. in diameter, pulvinate, black, densely crowded into large groups or covering nearly the whole leaf blade. Teleutospores smooth, chestnut brown, clavate, constricted in the middle, apex conical or rounded, much thickened, lower cell mostly attenuated, cuneiform, 47—75 x 24—30 μ. Pedicels firm, about as long as the spores.

On *Artemisia sp.* Kings River Cañon, Cal., July, 1892, leg. Holway. Very distinct from *P. Tanaceti*, DC., occurring on numerous species of *Artemisia*.

Puccinia Lagophyllæ, D. & H. Spots yellowish or none Sori of the uredo stage amphigenous, scattered, minute, brown. Uredospores ovoid or subglobose, brown, finely echinulate, with a thick epispore, 27—31 x 25—29 μ. Teleutospore layers black, circular or oblong, 1—2 mm. in diam., often circinating and confluent. Teleutospores ovoid or elliptical, rounded on both ends or attenuated below, slightly constricted at the septum, smooth, chestnut brown, lower cell usually lighter, apex thickened 6—9 μ, 38—55 x 22—32 μ. Pedicels colorless, deciduous, longer than the spores.

On *Lagophylla congesta*. Berkeley, Cal., in the University Bot. Garden, July, 1893, leg. Blasdale.—We are not able to indentify this with any species described on Compositæ.

Puccinia Baccharidis, D. & H. Amphigenous. Uredo-

sori numerous, scattered, minute, ochraceous, pulverulent. Uredospores ovoid or elliptical with a pale brownish, echinulate membrane perforated by numerous germ-pores, which are distributed over the whole surface, 34—44 x 21—31 μ. Teleutosori minute, pulvinate, pale. Teleutospores clavate or oblong, rounded at the little thickened apex, attenuated or rounded below, constricted at the septum, pale brownish, smooth, 56—74 x 23—32 μ. Pedicels firm, mostly longer than the spores, inflated, often very considerably. The teleutospores germinate directly after their maturation without any period of rest.

On *Baccharis viminea*. Pasadena, Cal., Aug., 1893, leg. McClatchie (No. 359).—This fungus has most resemblance to another Californian species on *Baccharis pilularis*, viz.: *Puccinia evadens*, Hark. In the "Provisional Host-Index of the Fungi of the United States" of Farlow and Seymour *Puccinia evadens* is also noted as occurring on *Baccharis viminea*. But there can be no doubt as regards the specific difference of the forms. The teleutospores of *P. evadens*, have a broad cap-like apical thickening of ca. 8μ, whereas in *P. Baccharidis* the thickened part of the apex is minute and only 3—4 μ thick. Another difference consists in the shape of the spore stalks, which in *P. evadens* are not inflated. I have not been able to examine whether the uredo stage exhibits any difference.

Puccinia mellifera, D. & H. Æcidia hypophyllous on yellow or brown spots, isolated or composed into little groups, cinnamon colored, dusty. Pseudoperidia elongated, deeply slit, very perishable; peridial cells cylindrical, somewhat rough or nearly smooth, easily separable from one another. Æcidiospores ovoid or subglobose, finely verrucose, brownish, with numerous germ-pores, 29—40 x 24—29 μ. Teleutospore layers mostly epiphyllous, roundish, ca. 1 mm. in diameter, naked, black-brown. Teleutospores elliptical, rounded on both ends, slightly constricted in the middle, little thickened, if at all, at the apex, smooth, chestnut brown, 40—50 x 28—35 μ. Pedicels of moderate strength, measuring up to 80 μ.

On *Salvia mellifera.* Pasadena, Cal., leg. McClatchie (No. 297). The same fungus has been sent by Dr. Harkness to the late Dr. G. Winter apparently on the same host plant. It has been confounded hitherto with *Puccinia nigrescens,* Pk., a species with smaller teleutospores, which are verrucose and not smooth, as principally described.

ON CERTAIN LEAF-HAIR STRUCTURES.

By Walter C. Blasdale.

The structures which I shall consider in this paper occur in great abundance on the fronds or leaves of certain ferns of the genera *Gymnogramme*, *Notholæna*, and *Cheilanthes* and on at least five species of the genus *Primula.* Though normally occurring on the lower surface only, they may appear on the upper, and in all cases are distributed quite uniformly; that is, without reference to the sori veinlets or other organs.

They may be designated as simple capitate hairs, and the secretions to which they give rise, and which distinguish them from all similar structures, consist of certain mealy products that vary both in color and consistency. Some are crystalline, some are waxy or even oily, while others are merely granular. In color these secretions present various shades of yellow, red or orange but may be pure white.

According to Hooker's Synopsis Filicum, there are in the genus *Gymnogramme* seven species that bear these glands; and, chiefly on this account, they have been set apart as the *Ceropteris* division, though certain botanists have considered the group a distinct genus in itself. The species are as follows:

G. triangularis, Kaulf. A widely distributed species appearing on the Western Coast of America and reported to range from Vancouver Island to Peru.

G. tripfoliata, Desv. A native of Cuba, Brazil and Peru. The fertile fronds bear an abundance of white or yellow powder.

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NEW CALIFORNIAN UREDINEÆ.—II.

By P. Dietel.

Uredo laeviuscula, D. & H. Sori hypophyllous, scattered, minute, hemispherical, long covered by the epidermis, enclosed in a pseudoperidium closely pressed to the epidermal tissue. Spores very irregular, mostly pyriform or oblong, often angular, 30—40x15—22 μ. Membranes colorless, smooth or nearly so.

On *Polypodium Californicum.* Mt. Tamalpais, May, 1893, leg. W. C. Blasdale.

The spores of this species remain enclosed a very long time in the pseudoperidium formed by flat sterile cells. In microscopical sections not too thin through a sorus the whole space between the peridium and the hymenium is closely filled with spores. It is to this mutual pressure that the very irregular form of the spores is due.

Uredo Pteridis, D. & H. Sori hypophyllous, small, oblong, extending along the primary and secondary veins of the leaves, yellow when fresh, afterwards turning pale. Spores ovoid to pyriform, with colorless echinulate membranes, 30—45x18—27 μ.

On *Pteris aquilina.* Pasadena, Jan., 1893, leg. A. J. McClatchie.

This is distinctly different from the common *Uredo Polypodii* (Pers.) and the similar *Uredo Aspidiotus,* Pk. by the spinosity of the epispore, whereas the echinulate *Uredo Scolopendrii* (Fckl.) differs by its general appearance as well as by the form of the spores.

Puccinia McClatchieana, D. & H. Hypophyllous; sori punctiform, pulvinate, scattered or disposed along lines; but without tendency for flowing together. Teleutospores very slender, club shaped or fusiform, truncate or rounded or obconical at the apex, thickened, 6—11 μ, attenuated below, constricted at the septum, smooth, brown, 40—75x18—23 μ.

Pedicel stout, dark brown, attaining the length of the spores.

On *Scirpus sylvaticus*. Pasadena, Nov., 1892, leg. A. J. McClatchie.

Puccinia recondita, D. & H. Spots bright yellow to wanting; sori hypophyllous, small, pulvinate, densely crowded into roundish groups of 2–5 mm. diameter, cinnamon-colored. Teleutospores clavate, thickened above, 5–8 μ, rounded or mostly conical, attenuated or rounded below, central constriction distinct, membranes pale brownish, smooth, 40–56 x15–23 μ. Pedicels stout, colorless, about the length of the spores.

On *Artemisia heterophylla*. Pasadena, Dec., 1893, leg. McClatchie.

This fungus belongs to the section *Leptopuccinia*, because the spores germinate immediately after ripening.

Puccinia punctiformis, D. & H. Sori amphigenous, principally hypophyllous, scattered, punctiform, about 0.2–0.4 mm. in diameter. Uredosori ochraceous, uredospores obovate with a thin echinulate epispore, brownish, with four equatorial germ-pores, 28–40x20–27 μ. Teleutosori dark brown, teleutospores mostly clavate, base attenuated, summit rounded or conical, thickened (5–8 μ), slightly constricted, smooth, brown, 34–45x21–29 μ. Pedicels about half the length of the spores, stout.

On *Rumex salicifolius*. Berkeley, Jan., 1894, leg. Blasdale.

Puccinia palefaciens, D. & H. Diseased plants yellow. Sori minute, brown, afterwards grayish, densely crowded and covering the whole lower surface of the leaves, sparingly arising from the upper surface. Spores oblong, apex conical or rounded, thickened, 5.5–10 μ, lower cell attenuated or rounded at the base, central constriction distinct, epispore pale brown, smooth; 43–66x21–26 μ. Unicellular spores not rare. Pedicels persistent, as long as or longer than the spores.

On *Arabis Holboellii*. Pasadena, 1894, leg. McClatchie.

The teleutospores germinate readily after ripening. They are accompanied by spermogonia uniformly scattered over the upper surfaces of the leaves. By this peculiarity *Puccinia palefaciens* differs from the similar *Puccinia Holboellii* (Hornem.) Rostr. In this species, moreover, the sori are greater, more pulvinate and dark brown, nearly black, apart from some difference in the form of the spores. The true *Puccinia Holboellii*, as a comparison with authentic specimens from Greenland has proved, has been found in California by Mr. S. B. Parish on the same host plant near San Bernardino. There has also been collected by Mr. Parish a beautiful *Æcidium* hitherto undescribed, which may belong to the *Puccinia Holboellii*. The peridia are cylindrical, about 1 mm. long, erect, citrine, opening at the summit with a simple fissure. The æcidospores are from nearly spherical to oblong and measure 20—27x16—21 μ. Their membranes are minutely verrucose, colorless, the plasmatic contents are in fresh spores lemon-colored. We have not named this *Æcidium* because it is probably connected with *Puccinia Holboellii*. It may be suitable to remark that the *Æcidium Holboellii*, Hornem., is not identical with this *Æcidium* and is not at all an *Æcidium*, but is, as Rostrup* has demonstrated, the teleutospore-form of *Puccinia Holboellii*, Rostr.

Another *Æcidium* yet undescribed (**Æecidium Clarkiæ**, D. & H. in litt.) occurring on *Clarkiæ rhomboidea* (Falcon Valley, Wash., leg. Suksdorf) and *Zauschneria Californica* (Berkeley, Calif., leg. Blasdale) is apparently the æcidial stage of *Puccinia Clarkiæ*, Pk., and may be described as follows:

Pseudoperidia scattered almost over the whole under surface of the leaves, flat, with a recurved, finely denticulate margin. Spores orange yellow, subglobose or elliptical or angulate, 16—20x16—18 μ, with colorless, finely verrucose membranes.

In conclusion it may be remarked, that the *Puccinia Holwayi*, D. on *Allium* spec. described in *Hedwigia* 1893, page 29, is identical with *Puccinia Calochorti*, Pk.

*Fungi Grœnlandiae, 1888, p. 534.